SHEET INDEX

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RECORD OF CHANGES

DWG ISS	PREV FURN	STD	MFR DISC	SEE NOTE

SYMBOL
TAPE UNIT CONTROLLER
BOARD A
ELEMENT IDENT
A

TERM. MOD	FUNCT	TERM.	LOC
BLOCK0	I	009	3A2
BLOCK1	I	318	3A1
IBGSTPO	I	008	3A3
INF010	I	101	2A1
INF040	I	002	2A1
INF050	I	102	2A1
INF070	I	308	2A7
INIT0	I	219	2A7
LBEN1	I	304	3A7
PSTAT1	I	001	3A0
RC0	I	103	2A0
RWDINGB0	I	019	3A3
STOPP0	I	113	2A0
TIMB0	I	106	2A3
WETRK10	I	105	2A9
BKSPAC0	O	110	2H5
CLRCRCC0	O	311	2H6
ENRD0	O	004	2H0
ENR01	O	11A	2H0
INF140	O	203	3HA
INF150	O	204	3H1
MAINT1	O	305	3H7
ROCL0	O	215	2H0
REV0	O	208	2H2
RTA00	O	117	3H5
RTA10	O	317	3H6
RWTSTPC0	O	313	2H6
SFTCC0	O	312	2H6
STOPC0	O	012	2H6
STREQC0	O	310	2H6
SWTSTPC0	O	314	2H6
TTFF0	O	216	2H4
TTFR0	O	016	2H5
TTINIT0	O	209	2H8
TTMSTP0	O	309	2H6
TTREWC0	O	111	2H6
TTSEL0	O	315	3H7
TTSF0	O	116	2HA
TTSR0	O	316	2H4
TUCCODE0	O	2T1	2H0
WRCKTEN0	O	107	2H1
WRENAB0	O	100	2H2
WTA00	O	218	3H5
WTA10	O	017	3H6

TERM. MOD	FUNCT	TERM	LOC
FSTFORC0	OI	210	2H5
FSTREVC0	OI	112	2H5
FW00	OI	207	2H3
INF000	OI	201	3A8
INF020	OI	202	3A8
INF030	OI	302	3A8
INF080	OI	217	3A4
INF090	OI	212	2A5
INF100	OI	213	2A6
INF110	OI	214	2A6
INF120	OI	115	3A5
INF130	OI	015	3A6
INIT80	OI	205	2H7
MAINT0	OI	007	3H7
MOTCINH1	OI	006	2H3
ROBLKC0	OI	010	2H5
READC0	OI	011	2H5
TRCKA01	OI	300	3H5
TRCKA11	OI	303	3H5
TTFF1	OI	013	2H3
TTFR1	OI	108	2H3
TTSF1	OI	014	2H1
TTSR1	OI	118	2H3
TUCRC1	OI	301	2H0
WENAA0	OI	109	2H1
WENAB1	OI	003	2H2
WRITE0	OI	104	2H8
WTBG	OI	005	2H8
+5	P	000,119	3G7
GRD	G	200,319	3G7

SYSTEM USED ON	DESIGN CONTROL
COMMON SYSTEMS	IH

CURRENT DRAIN: 325mA

NOTES:

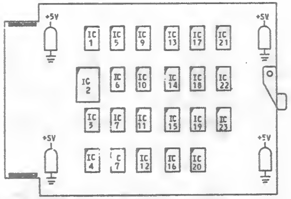
1. ⏚ GROUND RETURN
2. UNLESS OTHERWISE SPECIFIED.
   RESISTANCE VALUES ARE IN OHMS
   CAPACITANCE VALUES ARE IN MICROFARADS
   VALUES PRECEDED BY THE SYMBOL +(PLUS) OR −(MINUS) ARE IN VOLTS
3. BATTERY AND GROUND TERMINALS FOR INTEGRATED CIRCUITS

IC CODE	BAT. TERM.	GRD TERM.
41AD	16	8
41AE	↓	7,8
41BP		8
41BR		7,8
41CA		8
41CC		8
41CF		7,8
41CK		8
41U		8
41W	16	8
129A	24	12

4. BATTERY AND GROUND TERMINALS FOR THIS CIRCUIT PACK ARE AS FOLLOWS:

FUNCTION	TERMINAL
+5	000,119
GRD	200,319

5. HORIZONTAL MOUNTING CENTERS AT 0.50 INCH.
6. INTEGRATED CIRCUIT LOCATION GUIDE:
   (COMPONENT SIDE SHOWN)



UNMARKED COMPONENTS ARE FILTER CAPACITORS

DWG ISSUE	EE OR CD ISSUED	DATE ISSUE		APPD
1	—	10-11-74	LRE LRE	RWF MTS RFG
2A	—	1-5-76	LRE	JEJ LEG RFG

SUPPORTING INFORMATION

CATEGORY	NO.
CIRCUIT PACK CODE	JK16
CONNECTOR ON FRAME	947C OR 947A
ACCEPTABLE SERIES	1-2,2

SHEET INDEX NOTES

1. WHEN CHANGES ARE MADE IN THIS DRAWING ONLY THOSE SHEETS AFFECTED WILL BE REISSUED.
2. THIS SHEET INDEX WILL BE REISSUED AND BROUGHT UP TO DATE EACH TIME ANY SHEET OF THE DRAWING IS REISSUED, OR A NEW SHEET IS ADDED.
3. THE ISSUE NUMBER ASSIGNED TO A CHANGED OR NEW SHEET WILL BE THE SAME ISSUE NUMBER AS THAT OF THE FIRST SHEET.
4. SHEETS THAT ARE NOT CHANGED WILL RETAIN THEIR EXISTING ISSUE NUMBER.
5. THE LAST ISSUE NUMBER OF THE FIRST SHEET INDEX IS RECOGNIZED AS THE LATEST ISSUE NUMBER OF THE DRAWING AS A WHOLE.

NOTICE- NOT FOR USE OR DISCLOSURE OUTSIDE THE BELL SYSTEM EXCEPT UNDER WRITTEN AGREEMENT.

ISSUE 2A

1N98

JK16 CIRCUIT PACK

CARTRIDGE TAPE TRANSPORT CONTROLLER, BOARD A CIRCUIT

②

AT&TCO STANDARD

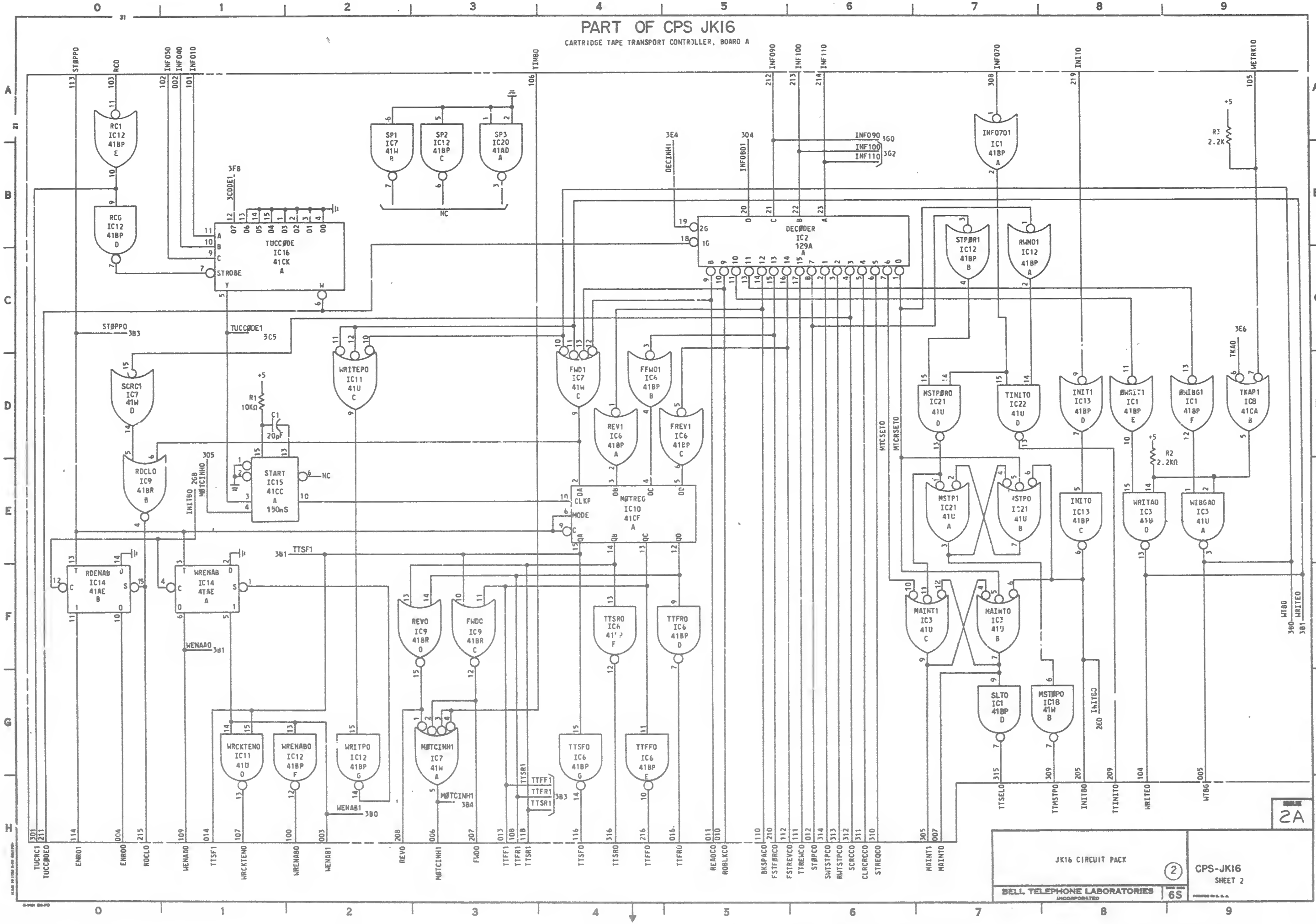
CPS-JK16
A SHEETS

BELL TELEPHONE LABORATORIES
INCORPORATED

6S

PART OF CPS JK16

CARTRIDGE TAPE TRANSPORT CONTROLLER, BOARD A



JK16 CIRCUIT PACK

② CPS-JK16

SHEET 2

BELL TELEPHONE LABORATORIES INCORPORATED

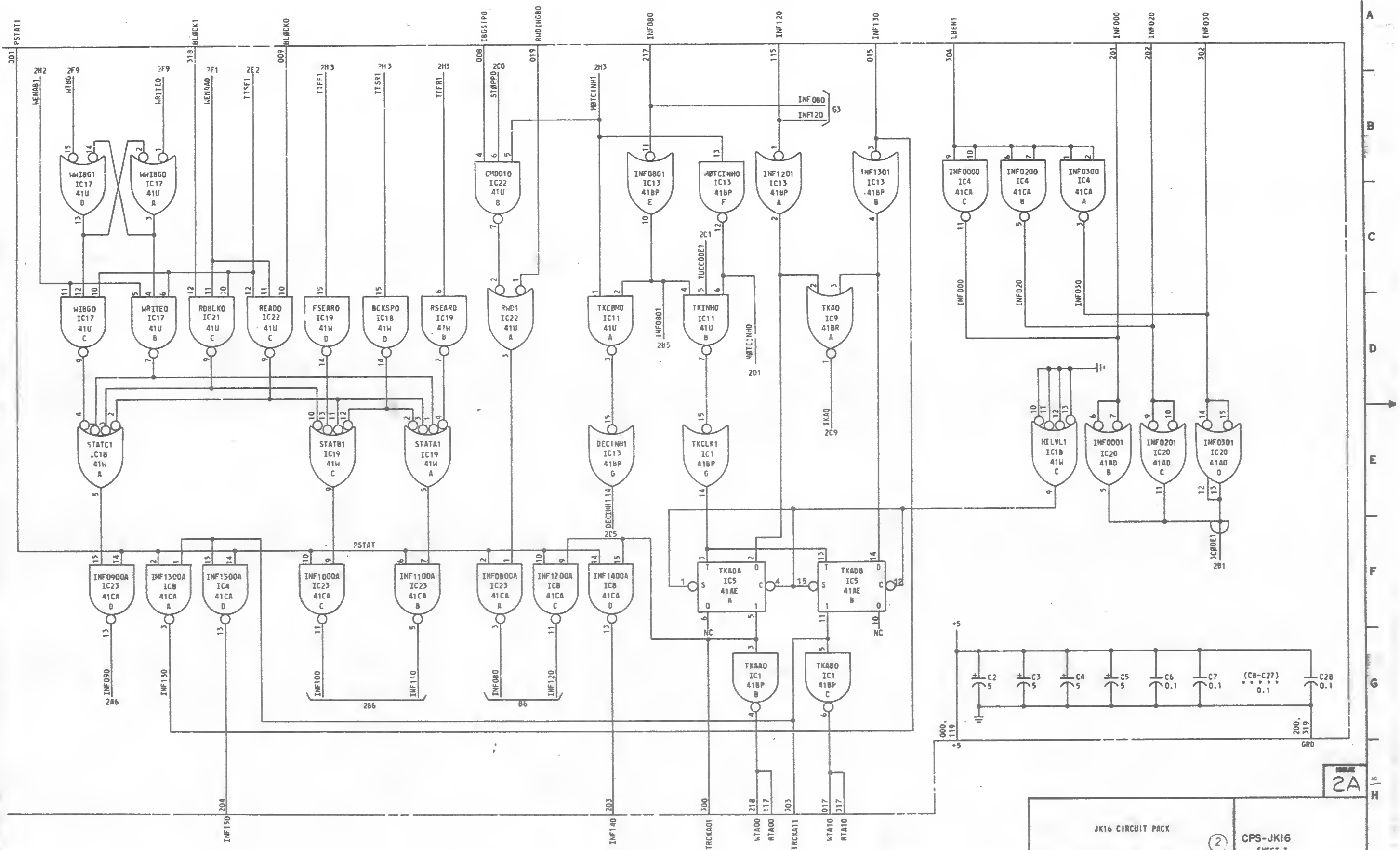
6S

ISSUE 2A

CPS-JK16

PART OF CPS JK16

CARTRIDGE TAPE TRANSPORT CONTROLLER, BOARD A



JK16 CIRCUIT PACK	② CPS-JK16 SHEET 3
BELL TELEPHONE LABORATORIES INCORPORATED	6S

ISSUE 2A

CPS-JK16

PART OF CPS JK16

CARTRIDGE TAPE TRANSPORT CONTROLLER, BOARD A

COMPONENT LIST

INTEGRATED CIRCUIT

LOC	IC1		IC2		IC3		IC4		IC5		IC6	
CODE	41BP		129A		41U		41CA		41AE		41BP	
ELEM ID	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC
A	INF07D1	2B7	DECØOER	2B5	WIBGAD	2E8	INFD300	3B8	TKADA	3F5	REV1	2D4
B	TKAAO	3G5			MAINTD	2F7	INF020D	3B7	TKADB	3F6	FFWD1	2D4
C	TKABD	3G6			MAINT1	2F6	INFD00D	3B7			FREV1	2D5
D	SLTD	2G7			WRITAD	2E8	INF1500A	3F1			TTFRD	2F4
E	ØWRIT1	2D8									TTFFO	2G4
F	ØWIBG1	2D8									TTSRD	2F4
G	TKCLK1	3E5									TTSFO	2G4

LOC	IC7		IC8		IC9		IC10		IC11	
CODE	41W		41CA		41BR		41CF		41U	
ELEM ID	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC
A	MØTCINH1	2G3	INF1300A	3F1	TKAD	3D6	MØTREG	2E4	TKCØMO	3D4
B	SP1	2A2	TKAP1	2D9	RDCLD	2E0			TKINHO	3D5
C	FWD1	2D4	INF1200A	3F4	FWDD	2F3			WRITEPD	2D2
D	SCRC1	2D0	INF1400A	3F4	REVO	2F3			WRCKTEND	2G1

LOC	IC12		IC13		IC14		IC15		IC16		IC17	
CODE	41BP		41BP		41AE		41CC		41CK		41U	
ELEM ID	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC
A	RWNCI	2C7	INF12D1	3B5	WRENAB	2F1	START	2E1	TUCCØDE	2C1	WWIBGO	3B1
B	STPØR1	2C7	INF13D1	3B6	RDENAB	2FD					WRITEG	3D1
C	SP2	2A2	INITD	2E7							WIBGD	3D0
D	RCD	2B0	INITI	2D7							WWIBGI	3B0
E	RCI	2A0	INFD8D1	3B4								
F	WRENABD	2G2	MØTCINHD	3B5								
G	WRITPG	2G2	DECINH1	3E4								

LOC	IC18		IC19		IC20		IC21		IC22		IC23	
CODE	41W		41W		41AO		41U		41U		41CA	
ELEM ID	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC
A	STATC1	3ED	STATA1	3E3	SP3	2A3	MSTP1	2E7	RWD1	3D3	INF0800A	3F3
B	MSTØPD	2F8	RSEARO	3D3	INFDD01	3E8	MSTPO	2E7	CMD01D	3B3	INF1100A	3F3
C	HILVL1	3E7	STATB1	3E2	INF0201	3E8	RDBLKO	3D1	READD	3D1	INF1000A	3F2
D	BCKSPD	3D2	FSEARD	3D2	INF0301	3E9	MSTPØRO	2D7	TINITO	2D7	INF0900A	3FD

CAPACITOR

	DESIG	CODE
	C1	KS-19774 L1,20pF
[4]	C2-C5	601A,5
[25]	C6-C28	KS-19774 L5,0.1

RESISTOR

DESIG	CODE
R1	KS-20616 L1A,10KΩ
R2	KS-20616 L1A,2.2KΩ
R3	KS-20616 L1A,2.2KΩ

CIRCUIT DESCRIPTION:

THIS CIRCUIT PACK IS ONE OF FOUR ASSOCIATED WITH THE CARTRIDGE TAPE TRANSPORT CONTROLLER PORTION OF THE TDC CIRCUIT. IT CONTAINS THE COMMAND DECODER, MOTION CONTROL, TRACK SELECTION, READ AND WRITE ENABLE REGISTERS, PRIMARY STATUS, AND MAINTENANCE CIRCUITRY.

THE 41CK, TUCCØDE, AND ASSOCIATED GATES, INFD001, INFD201, AND INF0301 ARE USED TO RECOGNIZE THE PROPER 3/6 DEVICE CODE AND MINIMIZE LOADING ON THE SPI PARALLEL BUS. USING THE INPUT RCO AS A STROBE, THIS CIRCUITRY INHIBITS ALL COMMANDS WHICH DO NOT CARRY THE PROPER DEVICE CODE. OUTPUTS FROM TUCCØDE STROBE THE 129A COMMAND DECODER. FROM INPUTS INF090, INF100, INF110 AND GATED INF080, THE COMMAND DECODER PULSES ONE OF ITS 16 OUTPUT COMMAND LEADS. THE 16 COMMANDS ARE: READ CONTINUOUS (READCO), READ-ONE-BLOCK (RDBLKCO), WRITE (FEEDS ØWRIT1), WRITE IBG (FEEDS ØWIBG1), BACKSPACE (BKSPACO), FAST FORWARD (FSTFØRCO), FAST REVERSE (FSTREVCO), REWIND (TTREWCD), STOP (STØPCD), SET WRITE STOP (SWTSTPCO), RESET WRITE STOP (RWTSTPCO), SHIFT CRC (SCRCCD), CLEAR CRC (CLRCRCCO), STATUS REQUEST (STREQCD), SET MAINTENANCE (MTCSETO), AND RESET MAINTENANCE (MTCRSETO). COMMANDS LISTED ABOVE WHICH REQUIRE ANY OF THE FOLLOWING MOTIONS OF THE TRANSPORT, SLOW FORWARD, SLOW REVERSE, FAST FORWARD, OR FAST REVERSE, FEED FWD1, REV1, FFWD1, AND FREV1, RESPECTIVELY. THE OUTPUTS FROM THESE GATES FEED THE 41CF, MØTREG, WHICH IS THE TAPE MOTION CONTROL REGISTER. THE 41CC, START, WHICH IS TRIGGERED BY TUCCØDE1, STROBES MØTREG APPROXIMATELY 150 ns AFTER DECØDER IS STROBED. THIS DELAT PROVIDES SETUP TIME FOR COMMANDS FROM THE DECODER. THE FOUR MOTION COMMANDS FROM MØTREG ARE BUFFERED BY TTSFO, TTSRO, TTFFO, AND TTFRO, AND FED DIRECTLT TO THE TRANSPORT. A STOP COMMAND OR A... ONE OF SEVERAL OTHER CONDITIONS ON JK18 WILL CAUSE STØPPO TO PULSE LOW. THE LEADING EDGE OF THIS PULSE CLEARS MØTREG. LEAD INF080 IS USED TO DESIGNATE MOTION COMMANDS. IT MUST BE IN A LOW STATE FOR THE 129A TO DECODE ANY OF THE EIGHT COMMANDS WHICH REQUIRE TRANSPORT MOTION. MØTCINH1 REMAINS IN A HIGH STATE IF ANY OF THE FOUR MOTION STATES ARE SET IN MØTREG. NOTE THAT IF INF080 IS IN A LOW STATE AND MØTCINH1 IS IN A HIGH STATE, THEN DECINH1 WILL BE IN A HIGH STATE WHICH INHIBITS THE 129A DECODER. THIS CIRCUITRY REQUIRES THAT THE TRANSPORT BE IN A STOP STATE BEFORE ANY MOTION COMMAND CAN BE DECODED. THE EIGHT COMMANDS WHICH DO NOT REQUIRE MOTION ARE DECODED IRRESPECTIVE OF THE STATE OF MØTCINH1.

READ AND WRITE OPERATIONS ARE CONTROLLED BY TWO D-TYPE FLIP-FLOPS, ROENAB AND WRENAB, RESPECTIVELY. NOTE THAT ALL COMMANDS REQUIRING SLOW FORWARD MOTION OF THE TRANSPORT (HIGH STATE OF FWD1) WILL SET ROENAB. A SHIFT CRC COMMAND ALSO SETS ROENAB. A WRITE OR WRITE IBG COMMAND, WHICH SETS BOTH RDENAB AND WRENAB TO CREATE A READ AFTER WRITE CONDITION, IS GATED THROUGH WRITAD OR WIBGAD BY TKAP1. TKAP1 IS ACTIVE, OR IN A HIGH STATE, WHEN EITHER WETRK10 OR TKAD IS IN A LOW STATE. LEAD WETRK10 REMAINS HIGH TO WRITE PROTECT INFORMATION ON THE TAPE PROGRAM TRACK, TRACK 1. TKAD IS IN A HIGH STATE ONLY WHEN BOTH INF120 AND INF130 ARE IN HIGH STATES. A HIGH STATE ON BOTH INF120 AND INF130 INDICATE THE SELECTION OF TRACK 1.

GATED INF120 AND INF130 FEED TKADA AND TKADB, RESPECTIVELY. THESE TWO D-TYPE FLIP-FLOPS CONTROL TRACK SELECTION USING A 2-BIT BINARY CODE. NOTE THAT TKINHO ONLY ALLOWS A CHANGE IN TRACK SELECTION WHEN THE TRANSPORT IS IN A STOP STATE, THAT IS, MØTCINH1 IS IN A LOW STATE.

PRIMARY STATUS OF THE CONTROLLER IS GENERATED BY A DISCRETE GATE ENCODER. SEVEN OF THE MOTION COMMANDS, WRITE IBG, WRITE, READ-A-BLOCK, READ, FAST FORWARD, BACKSPACE, AND FAST REVERSE ARE SELECTED BY GATES WIBGO, WRITEO, RDBLKO, READO, FSEARD, BCKSPO, AND RSEARO, RESPECTIVELY. INPUTS BLØCK1 AND BLØCKD ARE THE OUTPUT OF A FLIP-FLOP LOCATED ON JK18 WHERE BLØCK1 IS IN A HIGH STATE WHEN ONLY ONE BLOCK IS TO BE READ, THAT IS A READ-A-BLOCK OR A BACKSPACE COMMAND HAS BEEN ISSUED. (BACKSPACE IS ESSENTIALLY A REVERSE READ OPERATION, EXCEPT THAT NO DATA IS TRANSFERRED.) OUTPUTS FROM THESE SEVEN GATES, WHICH INDICATE THE OPERATING MODE OF THE TRANSPORT, SELECTIVELY FEED STATC1, STATB1, AND STATA1. THE OUTPUTS OF THESE THREE GATES GENERATE A 3-BIT CODE WHICH IS GATED THROUGH INF0900A, INF1000A, AND INF1100A BY PSTAT1. OUTPUTS FROM THESE THREE GATES RECREATE THE ORIGINAL STATES, ON I/Ø LEADS INF090, INF100, AND INF110, WHICH WERE PRESENT WHEN THE COMMAND WAS ISSUED FROM THE PARALLEL BUS. PSTAT1 IS ACTIVE OR IN A HIGH STATE WHEN THE BUS IS PREPARED TO RECEIVE A REPLY FROM THE CONTROLLER.

CM0010 INDICATES WHETHER THE CONTROLLER IS IN A STOP STATE. ITS OUTPUT IS IN A HIGH STATE WHENEVER THE TRANSPORT IS EITHER STOPPED OR IN THE PROCESS OF STOPPING. WHEN A STOP COMMAND IS ISSUED, INPUT IBGSTPO, WHICH IS AN OUTPUT FROM JK18, GOES LOW IMMEDIATELY AND REMAINS LOW UNTIL STØPPO GOES LOW. STØPPO GOES LOW ONLY AFTER THE TRANSPORT HAS REACHED AN IBG ON THE TAPE AND WILL REMAIN LOW UNTIL THE TRANSPORT HAS REACHED A COMPLETE STOP, APPROXIMATELY 40 ms. AS STATED EARLIER, THE LEADING EDGE OF STØPPO CLEARS MØTREG WHICH CAUSES MØTCINH TO GO LOW. THE OUTPUT OF CM0010 WILL REMAIN IN A HIGH STATE UNTIL MØTCINH IS DRIVEN HIGH AGAIN.

SINCE A REWIND OPERATION OF THE TRANSPORT IS NOT NORMALLY STOPPED BY THE CONTROLLER, PROVISIONS WERE MADE IN THE STATUS CIRCUITRY WHERE RWDINGBO, CAN OVERRIDE THE HIGH (OR STOP) STATE OF CM0010. IF THE TRANSPORT IS IN A REWIND MODE, RWDINGBO WILL BE IN A LOW STATE. THIS CAUSES THE OUTPUT OF RWD1 TO GO HIGH, IRRESPECTIVE OF THE STATE OF CM0010. GATING OF RWD1 THROUGH INF0800A COMPLETES THE 4-BIT CODE WHICH INDICATES THE FUNCTIONAL STATUS OF THE TRANSPORT.

THE OUTPUT OF TKADA FEED INF1200A AND INF1400A, AND THE OUTPUT OF TKADB FEED INF1300A AND INF1500A. THESE FOUR GATES INDICATED THE STATUS OF THE TRACK SELECTED WHEN PSTAT1 IS ACTIVE. INF0000, INFD200, AND INFD300 ARE DRIVEN LOW BY LBEN1 WHENEVER A STATUS IS REQUESTED FROM THE TAPE CONTROLLER. THESE GATES DRIVE I/Ø LEADS INF000, INFD20, AND INF030, WHICH ARE THE ACTIVE 3 BITS OF THE TAPE CONTROLLER'S 3/6 DEVICE CODE.

INPUT INITO IS USED TO INITIALIZE THE CONTROLLER CIRCUITS. THE OUTPUT FROM INITO RESETS THE [illegible] GATE FLIP-FLOPS, MAINT1/MAINTO AND MSTP1/MSTPO, RESETS ROENAB AND WRENAB AND CLEARS MØTREG WHICH COMPLETES INITIALIZATION OF JK16. MAINT1/MAINTO CAN BE SET BY EITHER A MAINTENANCE COMMAND (PULSE ON MTCSETO) OR A MAINTENANCE STOP COMMAND (PULSE ON STØPCO WHILE INF070 IS IN A LOW STATE). IT IS RESET BY EITHER A RESET MAINTENANCE COMMAND (PULSE ON MTCRSETO) OR A PULSE ON INITO. A LOW LEVEL FROM MAINTO GATED THROUGH SLTO WILL INHIBIT ALL INPUTS TO THE TRANSPORT AND UNDER NORMAL OPERATING CONDITIONS, CAUSE THE TRANSPORT TO STOP. SETTING OF THIS MAINTENANCE FLIP-FLOP ALSO ALLOWS THE CONTROLLER TO BE EXERCISED WITHOUT USE OF THE TRANSPORT. THE SECOND MAINTENANCE FLIP-FLOP MSTP1/MSTPO CAN BE SET BY A MAINTENANCE STOP COMMAND AND RESET BY EITHER A RESET MAINTENANCE COMMAND OR A PULSE ON INITO. WHEN MSTP1 IS IN A HIGH STATE, TTMSTPO GOES LOW. THIS WILL DISABLE THE TRANSPORT AND STOP ANY MOTION, IRRESPECTIVE OF WHAT MODE OF OPERATION THE TRANSPORT WAS IN. (A HIGH LEVEL ON TTSELO WILL NOT STOP A REWIND SEQUENCE.) A LOW PULSE FROM TTNITO WILL INITIALIZE THE TRANSPORT TO THE LOAD POINT ON TAPE. THIS PULSE IS THE COMBINATION OF A LOW LEVEL ON INPUT INF070 AND A LOW PULSE ON MTCRSETO (RESET MAINTENANCE COMMAND).

2A

JK16 CIRCUIT PACK

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BELL TELEPHONE LABORATORIES
INCORPORATED

6S

CPS-JK16
SHEET 4